

L Number	Hits	Search Text	DB	Time stamp
1	3217	((138/97) or (138/98) or (15/104.05) or (15/104.09) or (15/104.31) or (701/28) or (901/44) or (901/46) or (901/47)).CCLS.	USPAT; US-PGPUB	2003/08/20 15:28
2	567807	releasable or releasably or released	USPAT; US-PGPUB	2003/08/20 15:28
3	1687156	remove or removable or removed	USPAT; US-PGPUB	2003/08/20 15:29
4	54815	interchangeable	USPAT; US-PGPUB	2003/08/20 15:29
5	59	((((138/97) or (138/98) or (15/104.05) or (15/104.09) or (15/104.31) or (701/28) or (901/44) or (901/46) or (901/47)).CCLS.) and interchangeable	USPAT; US-PGPUB	2003/08/20 15:29
6	1687534	2or (remove or removable or removed)	USPAT; US-PGPUB	2003/08/20 15:29
7	1892565	(releasable or releasably or released) or (remove or removable or removed)	USPAT; US-PGPUB	2003/08/20 15:29
8	1359	((((138/97) or (138/98) or (15/104.05) or (15/104.09) or (15/104.31) or (701/28) or (901/44) or (901/46) or (901/47)).CCLS.) and ((releasable or releasably or released) or (remove or removable or removed))	USPAT; US-PGPUB	2003/08/20 15:30
9	37	(((((138/97) or (138/98) or (15/104.05) or (15/104.09) or (15/104.31) or (701/28) or (901/44) or (901/46) or (901/47)).CCLS.) and interchangeable) and (((138/97) or (138/98) or (15/104.05) or (15/104.09) or (15/104.31) or (701/28) or (901/44) or (901/46) or (901/47)).CCLS.) and ((releasable or releasably or released) or (remove or removable or removed))))	USPAT; US-PGPUB	2003/08/20 15:33

US-PAT-NO: 6031371

DOCUMENT-IDENTIFIER: US 6031371 A

TITLE: Self-powered pipeline vehicle for carrying out
an
operation on a pipeline and method

DATE-ISSUED: February 29, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP
Smart; Andrew	Loughborough	N/A	N/A
GB			

ASSIGNEE INFORMATION:

NAME	CITY	STATE	ZIP CODE
BG plc	Berkshire	N/A	N/A
03			GB

APPL-NO: 08/ 952115

DATE FILED: March 23, 1998

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
GB	9510434	May 22, 1995

PCT-DATA:

APPL-NO: PCT/GB96/01214

DATE-FILED: May 21, 1996

PUB-NO: WO96/37727

PUB-DATE: Nov 28, 1996

371-DATE: Mar 23, 1998

102(E)-DATE: Mar 23, 1998

INT-CL: [07] F16L055/26, F16L055/18, G01N027/72

US-CL-ISSUED: 324/220, 138/97, 166/55, 166/55.7,
324/226

US-CL-CURRENT: 324/220, 138/97, 166/55, 166/55.7,
324/226

FIELD-OF-SEARCH: 324/219-221; 324/226; 324/262;
73/40.5; 73/623; 15/104.05
; 15/104.063; 15/104.09; 165/11.2; 166/55;
166/55.7
; 166/55.8; 138/97

REF-CITED:

U.S. PATENT DOCUMENTS		
PAT-NO	ISSUE-DATE	PATENTEE-NAME
	US-CL	
3238448	March 1966	Wood et al.
324/220	N/A	N/A

3949292	April 1976	Beaver et al.	
324/220	N/A	N/A	
4050384	September 1977	Chapman	
N/A	324/220	N/A	
4443948	April 1984	Reeves	N/A
N/A	N/A		
4447777	May 1984	Sharp et al.	
324/220	N/A	N/A	
4481816	November 1984	Prentice	N/A
N/A	N/A		
4581938	April 1986	Wentzell	73/623
N/A	N/A		
4852391	August 1989	Ruch et al.	
73/40.5	N/A	N/A	
4986314	January 1991	Himmler	
166/55.7	N/A	N/A	
5025215	June 1991	Pirl	324/220
N/A	N/A		
5197540	March 1993	Yagi et al.	
166/55.8	N/A	N/A	
5313838	May 1994	Gondard et al.	N/A
324/220	N/A		
5396800	March 1995	Drinon et al.	
73/623	N/A	N/A	

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY
US-CL		

4024926	February 1992	DE
---------	---------------	----

ART-UNIT: 282

PRIMARY-EXAMINER: Strecker; Gerard

ATTY-AGENT-FIRM: Oblon, Spivak, McClelland, Maier & Neustadt, P.C.

ABSTRACT:

An in-pipe vehicle for carrying out at least one operation in a pipeline.

The vehicle includes a train of modules interlinked by suspension units to allow serpentine movement through pipe bends. The vehicle train has its own internal power supply and drive mechanism in the modules. A detector module determines the presence of a service junction using magnetic field information.

A manipulative module allows the vehicle to be temporarily wedged in the pipeline while providing rotational movement to facilitate the desired operation at the junction. This may include drilling and welding of a service pipe to the main using appropriate modules. A remote probe typically containing a magnetic field generator can be used to assist in service junction location by the vehicle.

30 Claims, 8 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 8

----- KWIC -----

Detailed Description Text - DETX (3):

A number of existing service pipe take-offs 4 each provide the source of gas to individual dwellings or other premises. As part of the refurbishment programme, there is a need to insert a liner in each service pipe and to join this to the main liner 2. In order to achieve this it has been necessary in the past to make an excavation at each service connection 5 (e.g. a screwed pipe connector or a service tee) and penetrate the main liner 2 through the excavation, sealing the take off to the main using a saddle connection, having removed part of the cast iron main in that region.

Detailed Description Text - DETX (4):

In the present invention, the need to have individual excavations is avoided as is the need to remove portions of the cast iron main at such excavations. FIG. 2 shows the mechanism now employed.

Detailed Description Text - DETX (19):

The manipulator module 13 again activates its extenders and clamps itself to the main pipe. A rotation of the module is effected if it is determined that this is necessary to locate the detector 70 in front of the tee. The hole already drilled in the main liner allows the service pipe liner to be inserted through the service pipe using a very flexible guide wire. The service liner has at its front end a tapered lead component formed from cross-linked polyethylene. The presence of the guide wire confirms to the detector that the correct service tee is being refurbished. Once the lead end is located in the drilled hole, the guide wire is removed, indicating that the jointing step can be effected. Thus the manipulator 13 rotates through 180.degree. to locate the heater device 71 on the fusion module 16 adjacent to the region of the service liner end, within the main liner hole and electric power is applied to the heater to fuse the joint in the liners by raising the temperature to the crystalline melt stage, causing the service liner end-piece to expand and fuse simultaneously to the main liner.

Detailed Description Text - DETX (25):

Each sledge 104 is retained by pins 120, 122 fixed in the body 114 and projecting into slideways 124, 126 in the sledge 104. Each slideway 124, 126 terminates in an axially extending clearance hole 128, 130. Each sledge 104 can be removed from the body 114 by holding it in its radially innermost position, as shown in the upper half of FIG. 2 and knocking the pins 120, 122 inwardly into the clearance holes 128, 130.

Detailed Description Text - DETX (37):

The probe in the service pipe can be removed and replaced with the guide wire which carries the service pipe liner, before fusing this liner to the main pipe liner.

Current US Cross Reference Classification - CCXR (1):
138/97